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Syntomopus Walker: The Nearctic Species with a Review of Known Host Associations (Hymenoptera: Pteromalidae)

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Abstract. – *Syntomopus* Walker is a cosmopolitan genus of 13 described species. *Syntomopus* is defined, its relations to other pteromalid genera are discussed and a host list is presented for the species. Known hosts include mostly stem–mining Agromyzidae, but stem–mining Lepidoptera, and possibly Cynipidae are also hosts. The species of the United States and Canada are reviewed. *Syntomopus affinis* Ashmead, 1896 is synonymized with *S. americanus* Ashmead, 1894 and a new Nearctic species, *S. arpedes*, n. sp., is described.

Syntomopus Walker contains 13 described species: *S. shakespearei* (Girault), 1913 from the Australian region; *S. agromyzae* Hedqvist, 1972, *S. incisus* Thomson, 1878, *S. incurvus* Walker, 1833, *S. oviceps* Thomson, 1878, *S. pallipes* Rudow, 1886, and *S. thoracicus* Walker, 1833 from the Palearctic region; *S. fuscipes* Huang, 1991 from the Oriental region; *S. gracilis* De Santis, 1976 (in De Santis et al., 1976), *S. incidoideus* Howard, 1896, and *S. parsii* De Santis, 1976 from the Neotropical region; and *S. affinis* Ashmead, 1896 and *S. americanus* Ashmead, 1894 from the Nearctic region. In this paper, I synonymize *S. affinis* with *S. americanus* and describe a new Nearctic species, *S. arpedes*, n. sp.

Terminology in this paper follows that of Graham (1969), except that genal concavity is used instead of genal hollow and club is used instead of clava. In addition, the gastral terga are numbered T1–T7 beginning with the first tergite after the petiole. The following abbreviations are used: the median ocellar diameter is MOD, the ocellar–ocular distance is OOL, the posterior ocellar distance is POL, the lateral ocellar distance is LOL, the multiporous plate sensilla are MPP sensilla, the lower ocular line is LOcL, and the antennal funicular segments are F1 through F6. The units of measurement given in the descriptions can be converted to millimeters by multiplying by 0.02. The acronyms for the museums from which specimens were examined are given in the Acknowledgments.

Genus **Syntomopus** Walker

Syntomopus Walker, 1833:371, 372. (Type species: *Syntomopus thoracicus* Walker, 1833; sub. desig. by Westwood, 1839:69; examined). Förster, 1856:52, 56. Thomson, 1878:17, 23. Ashmead, 1904:330, 331. Schmiedeknecht, 1909:374, 375, 376–377. Nikol'skaya, 1963:247–248. Peck, Bouček, and Hoffer, 1964:40. Graham, 1969:124, 137–140. Hedqvist, 1972:210–215. Dzhanokmen, 1978:76, 79–80. Burks, 1979:787. Bouček, 1988:238, 466.

Merismorella Girault, 1926:1. (Type species: *Merismorella shakespearei* Girault; monotypy; not seen). Bouček, 1988: 466 (synonymy).

Description.— Head, mesosoma, coxae, petiole, gaster metallic dark blue or green; scape metallic or nonmetallic. Head with clypeus having three broad symmetrically arranged clypeal denticles (Fig. 1); lateral part of mouth margin with short genal concavity; antennal torulus distinctly above LOcL. Antenna with scape cylindrical, 5X as long as wide; flagellum compact, with segments cylindrical and typically transverse in females (quadrate in *S. agromyzae*); MPP sensilla in single row; club of female without large patch of micropilosity, tip lacking spine. Maxilla of male with palp slender, stipites unenlarged. Mesosoma flattened dorsally (Fig. 2) except in *S. agromyzae*; pronotal collar long, length 1/4–1/3 its width, dorsal level of collar below that of vertex, humeral angles squared, anterior edge rounded; notaulus shallow; scutellum

typically about as long as wide (longer than wide in *S. agromyzae*), lacking anterior median groove, with two pairs of lateral setae, frenal area nearly indistinguishable from remainder of scutellum; dorsellum crescent–shaped; propodeum with median panels long (width about 1.5X length), median carina (except in *S. incisus*) and plicae well developed and connected posteriorly by W–shaped carina. Fore wing with relative lengths of veins as follows: submarginal > marginal > postmarginal > stigmal; costal cell with at least one complete row of setae; basal cell bare; basal vein setose or bare; speculum developed, open posteriorly. Petiole longer than wide, cylindrical; with complete basal flange continuous laterally and ventrally; without median carina; lateral setae present. Gaster of female ovate acuminate; hypopygium extending to near tip of T7; in both sexes hind margin of T1 sinuous laterally, typically emarginate medially (entire in *S. oviceps*).

Discussion.— Finding a suite of character states to define *Syntomopus* is complicated by intermediate forms between it and *Thinodytes* Graham, *Mauleus* Graham, and *Ploskana* Bouček. The most distinctive characteristic of most *Syntomopus* species is the flattened mesosoma (Fig. 2), but this character state is of limited value for defining the genus. Flattened thoraces, similar to those of most *Syntomopus* species, occur throughout the Pteromalidae in many genera including *Ploskana*, *Ksenoplata* Bouček, and *Anogmus* Förster. Some *Syntomopus* species, such as *S. agromyzae* and some undescribed Neotropical species, have a normally arched mesosoma. As noted by Boucek (1988), the pronotal collar of *Syntomopus* is large, being 1/4 to 1/3 as long as wide and rectangular in dorsal view (Fig. 2). The pronotum of *Ploskana* is similarly lengthened, but it is distinctly narrowing anteriorly (see fig. 3, Boucek 1976). Besides having the character states defining the *Halticoptera*–group [those miscogasterine genera characterized by a reticulately sculptured body, acarinate pronotal collar, weakly developed notauli, weakly delimited frenum, propodeum with sharp median carina and plicae connected posteriorly by W–shaped carina, petiole with a basal bracing consisting of an anteriorly directed lateral and ventral flange, and the hind margin of the first gastral tergum being sinuous laterally and usually emarginate medially; Heydon 1988], *Syntomopus* can be defined relative to other related genera by possession of the following two autapomorphies: 1–three symmetrically arranged clypeal denticles (Fig. 1) and 2–an enlarged pronotal collar with squared humeral angles (Fig. 2). Genera of related groups such as the *Cyrtogaster*–group (Heydon 1989) and *Nodisoplata* Graham also have three symmetrically arranged clypeal denticles, but this symmetrical arrangement of clypeal denticles is unique for *Syntomopus* within the *Halticoptera*–group.

Graham (1969) placed *Syntomopus* as the closest relative of *Sphegigaster* Spinola. This relation was echoed by Bouček (1976) in his description of *Ploskana*, which he described as having similarities to both of the former two genera. However, a close relationship between *Syntomopus* and *Sphegigaster* is unlikely since there are no synapomorphies supporting such a relationship between them. Character states they share in common are either plesiomorphic, such as the rounded anterior edge of the pronotal collar, or synapomorphies both *Sphegigaster* and *Syntomopus* also share with the other genera of the *Halticoptera*–group, such as the shallow notauli, short postmarginal vein, obliterated frenal sulcus, long reticulate petiole, and sinuous lateral margin of T1. *Sphegigaster* lacks character states that define the *Halticoptera*–group such as the W–shaped carina connecting the median carina and plicae, and the median emargination of the first gastral tergum. In *Sphegigaster*, species lack all traces of propodeal carinae, and the hind margin of T1 is entire mesally.

Biology.— *Syntomopus* is exceptional among the Pteromalidae because hosts are known for many of the described species (Table 1). *Syntomopus* species are parasitoids, emerging from the pupal stadium of insects boring the stems of plants— commonly Asteraceae. Their hosts are mostly Diptera, but *S. arpedes*, *S. americanus*, and *S. incurvus* have been reared from lepidopteran stem borers, and *S. incisus* has been reared from a cynipid gall.

From the illustration, it is clear that the two pteromalid parasitoids identified as *Syntomopus*

Table I. Hosts of *Syntomopus* species.

Syntomopus species	Insect Host	Plant Host	Literature citation
Syntomopus agromyzae	*Hexomyza cecidogena* (Hering) (Diptera: Agromyzidae)	twig galls on *Salix caprea L.* (Salicaceae)	Hedqvist 1972
Syntomopus americanus	*Agromyza* sp. (Diptera: Agromyzidae)	*Ambrosia trifida* L. (Asteraceae)	Webster 1894
	Hexomyza schineri Giraud	*Populus tremula tremuloides* (Michaux)	
	?H. schineri Giraud	*Populus alba* L.	
	?Melanagromyza hicksi Steyskal (Diptera: Agromyzidae)	*Althaea rosae* L. (Malvaceae)	Hansberry 1940
	M. martini Spencer		
	M. virens Loew	*Parthenium argentatum* Gray (Asteraceae)	Lange 1944 Cassidy et al. 1950
	Phalonia voxcana Kft. (Lepidoptera: Cochylidae)	stems of *Prenanthes alba* L. (Cichorieae)	
	Phytomyza flavicornis Fallén (Diptera: Agromyzidae)		
Syntomopus arpedes	*Epiblema strenuana* (Walker) (Lepidoptera: Tortricidae)	*Ambrosia* sp. (Asteraceae)	
Syntomopus incisus	*Melanagromyza lappae* (Loew)	*Arctium vulgare* (Hill) Evans (Asteraceae)	Graham 1969
	M. aenoventris (Fallén)	*Cirisium eriophorum* (L.) Scopoli (Asteraceae)	Graham 1969
	M. dettmeri Hering	stems of *C. eriophorum*	Graham 1969
	Phanacis hypochaerides (Kieffer) (Hymenoptera: Cynipidae)	*Hypochoeris radicata* L. (Asteraceae)	Askew 1970

Table I. Hosts of *Syntomopus* species (continued).

Syntomopus species	Insect Host	Plant Host	Literature citation
Syntomopus incurvus	*Melanagromyza dettmeri* Hering		Graham 1969
	M. tripolii Spencer		Graham 1969
	Adaina microdactyla (Hübner) (Lepidoptera: Pterophoridae)		Askew 1970
Syntomopus oviceps	*Phytomyza flavicornis* Fallén (Diptera: Agromyzidae) stem borer	*Urtica dioica* L. (Urticaceae)	Graham 1969
Syntomopus parisii	*Melanagromyza cunctanoides* Blanchard	*Helianthus annuus* L. (Asteraceae)	DeSantis et al. 1976
Syntomopus shakespearei	*Liriomyza helichrysi* Spencer (Diptera: Agromyzidae)		Boucek 1988
Syntomopus thoracicus	*Melanagromyza aeneiventris* (Fln.)	stems of *Senecio jacobaea* L. (Asteraceae)	Graham 1969
	M. eupatorii Spencer		Graham 1969
	M. sojae Zehnter		Huang 1991
Syntomopus spp.	*Melanagromyza sojae* Zehnter	on bean (Fagaceae)	Kamijo 1983
	M. tomaterae Steyskal		Havránek 1987

species in Bruzon, Martinez, and Calderon (1968) are not *Syntomopus*.

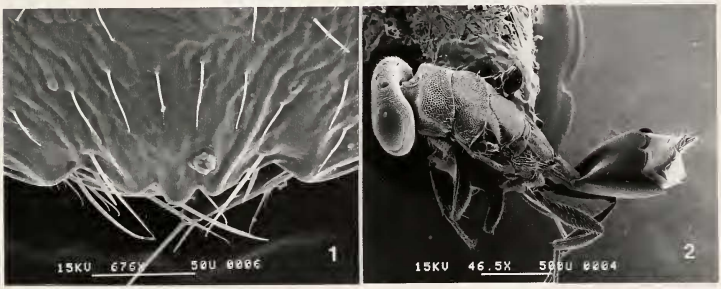
Syntomopus arpedes Heydon, **new species**
Figs. 2, 3

Holotype, female.— Color: Anterior of head, dorsum of mesosoma dark green, face and scutellum more blue; occiput, neck, pleural regions, coxae, petiole dark blue; gaster dark brown with metallic reflections on T1. Antenna with scape and pedicel yellow–brown with strong metallic green reflections; remainder brown. Legs with trochanters and femora brown with strong green reflections; tibiae yellowish brown mesally, paler at tips; fore tarsus yellow–brown; middle and hind tarsi white. Wing veins pale yellow–brown, parastigma more reddish brown.

Sculpture.— Clypeus smooth with fine striae laterally; frenum coriaceous; dorsellum smooth; T1–6 smooth; T7 coriaceous.

Structure.—Body length 2.3 mm. Head ovate in anterior view; width 1.2X height (36.5:31.0), 2.8X length (36.5:13.0) (Fig. 3); front of head flat, scrobes absent; lateral teeth of clypeus very weak; genal concavity extending 1/3 malar distance; eye height 2.1X length (19:9), 2.4X malar distance (19:8), length 3.0X temple length (9:3); ratio of MOD, OOL, POL, LOL as 3:6:9:4; torulus 1X own diameter above LOcL. Antenna with length of pedicel plus flagellum 0.79X head width (29.0:36.5); ratio of lengths of scape, pedicel, annelli, F1–6, club as 11.0:4.0:1.0:3.0:2.5:2.5:2.5:2.5:2.5:8.0; widths of F1, F6, club as 3:4:4; club with patch of micropilosity ventrally on terminal segment. Mesosoma flattened dorsally (Fig. 2), length 1.9X width (60.0:31.5), width 2.1X height (31.5:15.0); pronotum with sides weakly convergent anteriorly, humeral angles squared, length 0.35X width (9.5:27.0); propodeum in same plane as rest of mesosoma, median carina complete but weakly developed, plicae sharp but fading out just at anterior margin of propodeum, nucha acarinate anteriorly. Fore wing length 2.2X width (85:39); ratio of lengths of submarginal, marginal, postmarginal, stigmal veins as 37:20:13:8; costal cell with single complete row of setae; basal cell with single seta in right wing, without seta in left wing; basal vein with four setae in left wing, two in right. Petiole length 1.6X width (12.5:8.0); with four pairs of lateral setae directed anteriolaterally. Gaster length 1.4X width (38:27); hind margin of T1 emarginate mesally; hypopygium extending to end of T7.

Allotype, male.— Color: Similar to holotype except all metallic areas dark blue. Structure: Body length 1.8 mm. Head width 2.4X length (31:13). Antenna with length of pedicel plus flagellum 1.1X head width (35:31); ratio of lengths of scape, pedicel, annelli, F1–6, club as 10.0:3.0:1.0:4.0:4.0:3.5:4.0:3.5:3.5:8.5; widths of F1, F6, club as 3:3:3; MPP



Figures 1-2. *Syntomopus* species. 1, *americanus*, female clypeus. 2, *arpedes*, female habitus.

sensilla short, extending less than 1/2 length of funicular segments, only one or two visible per segment at a time; flagellar pilosity dense, fine, semierect. Petiole length 1.8X width (11:6). Gaster length 1.1X width (20:18).

Variation.— The body color of the males varies from blue, like in the allotype, to green, like in the holotype. The body length of the females varies from 1.7 to 2.3 mm, and the body length of males varies from 1.8 to 2.1 mm. The ratio of head width divided by length averages 2.62±(S.E.=)0.029 (n=11, range=2.5–2.8) for females and 2.5±0.023 (n=8, range=2.4–2.5) for males. Two of 12 females have setae on the basal vein and three of seven males do, but only one or two setae are usually present.

Discussion.— This species is similar to *S. americanus*, but the difference in the head shape, particularly of the females, is quite distinct (compare Figs. 3 & 4). The ratio of head width to length varies from 2.5–2.8 for females and 2.4–2.5 for males of *S. arpedes*, but from 2.2–2.4 for females and 2.1–2.4 for males of *S. americanus*. In addition, the vertex of *S. arpedes* females has a pinched appearance, while the vertex of *S. americanus* females is more evenly rounded anterioposteriorly. From the descriptions in De Santis et al. (1976), *S. arpedes* most closely resembles *S. parisii* in having the dorsum of the thorax very flat and the pronotum with the humeral angles squared. *S. arpedes* differs from *S.* parisii in having the scape metallic to the base and the side denticles of the clypeus much reduced compared to the central denticle. *S. parisii* has the scape yellow and the middle denticle of the clypeus only a little larger than the lateral denticles.

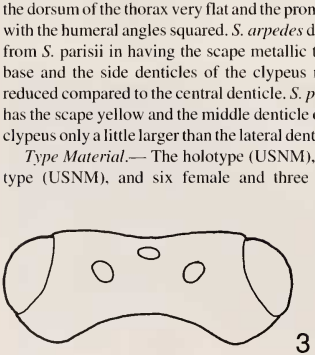
Type Material.— The holotype (USNM), allotype (USNM), and six female and three male paratypes (CMNH, USNM) were reared from a Zinnia stem borer in September 1940 by R. M. Bohart in Westwood Hills, Los Angeles County, California. An additional 14 paratypes were collected as follows (INHS, UCDC, USNM): United States. ALABAMA: 1♀. CALIFORNIA: 5 mi w. Yuba City, 5 & 11.II.1971 [reared from *Xanthium strumarium* (Asteraceae)], 4♀, 2♂; Needles, 30.I.1977, 1♀; southern California, 11.IX.1950 (Zinnia plants), 1♂. ILLINOIS: University of Illinois South Farms (nr. Champaign), 27.VI.1981, 1♀. MARYLAND: Eldorado, 17.IX.1930 [ex. *Epiblema strenuana* infested *Ambrosia* (Asteraceae)], 1♀. TEXAS: Alpine, 30.VIII.1971 [*Happlopapus* (=*Machaeranthera*) *gracilis* (Asteraceae)], 1♀. México. NUEVO LEON: 9 mi s. Monterrey, 11.VIII.1972, 1♀; in car from Guaymas at Nogales, 22.IX.1950, 1♂.

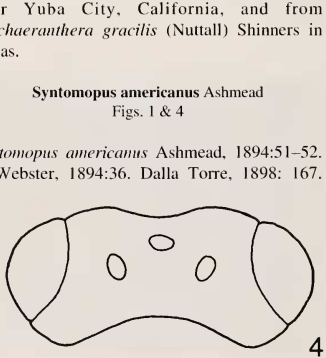
Etymology.— The species name is from the Greek *arpedes*, meaning even or flat, and refers to the flat head of this species.

Biology.— The only determined host of *S. arpedes* is a tortricid lepidopteran, *Epiblema strenuana* (Walker) infesting *Ambrosia* (Asteraceae). *Syntomopus arpedes* has been reared in association with a number of Asteraceae, including Zinnia stem–borer material from Westwood Hills, California, *Xanthium strumarium* L. from near Yuba City, California, and from *Machaeranthera gracilis* (Nuttall) Shinners in Texas.

Syntomopus americanus Ashmead
Figs. 1 & 4

Syntomopus americanus Ashmead, 1894:51–52. Webster, 1894:36. Dalla Torre, 1898: 167.





Figures 3-4. *Syntomopus* species. 3, *arpedes*, female head, dorsal view. 4, *americanus*, female head, dorsal view.

Nason, 1906:152. Schmiedeknecht, 1909:376. Girault, 1918:128. Glick, 1939:46. Hansberry, 1940:199, 711. Shread, Brigham, and Smith, 1941:495–496. Lange, 1944:394–395. Cassidy, Romney, Buchanan, and York, 1950:7. Peck, 1951:538. Peck, 1963:610. Burks, 1979:787.

Syntomopus affinis Ashmead, 1896:228, syn. n. Dalla Torre, 1898:167. Nason, 1906:152. Schmiedeknecht, 1909:376. Girault, 1918:128. Peck, 1951:538. Peck, 1963:609–610. Burks, 1979:787.

Ashmead (1896) gave the following differences between *S. americanus* and his new species *S. affinis*: 1. F1–5 elongate and F6 quadrate in *S. americanus*, while all the funicular segments transverse in *S. affinis*. 2. All the tibiae pale colored in *S. americanus*, while the middle and hind tibiae dark in *S. affinis*. 3. The median emargination of T1 deep in *S. americanus*, but running almost to the base of the first tergum in *S. affinis*. The type of *S. americanus* was misidentified as a female; however, and the differences listed above are those commonly found between males and females of a single common Nearctic *Syntomopus* species. The deeply cleft T1 must have been an error in observation because this state was not seen by me on the type or any other specimen of Nearctic *Syntomopus*. On the basis of my reexamination of the types of these two species and a comparison of the variation between the types and variation observed in other Nearctic *Syntomopus* material, I am synonymizing *S. affinis* with *S. americanus*.

Discussion.— Compared with the Palearctic *Syntomopus* species, *S. americanus* most closely resembles *S. incurvus* and *S. thoracicus*. Males of *S. americanus* differ from males of these Palearctic species by having the funiculus more slender, with all its segments, except sometimes F6, elongate. All the male funicular segments, except F1, are transverse in *S. thoracicus*, while F4–6 are transverse in *S. incurvus* (Graham 1969). *Syntomopus americanus* females differ from *S. incurvus* females by never having the anterior corners of the pronotum prominent and by having the stigmal vein shorter relative to the marginal vein. The length of the marginal vein averages 2.2±(S.E.=)0.023 (n=10) times that of the stigmal vein in *S. americanus*, but varies between 2.3 and 2.5 times in *S. incurvus*. Females of *S. americanus* have pale colored tibiae, not black like those of *S. thoracicus*. The ratio of head width divided by length averages 2.27±(S.E.=)0.025 (n=10, range=2.2–2.4) for females and 2.27±0.020 (n=10, range=2.1–2.4) for males of *S. americanus*.

Material examined.— *Syntomopus americanus* is among the most commonly collected species of miscogasterine pteromalids, and I examined 224 specimens from the following U.S. states and Canadian provinces and territories (ICCM, CNCI, FSCA, INHS, SEMC, UCDC, UCRC, USNM): Arizona, California, Colorado, Delaware, Florida, Illinois, Iowa, Idaho, Maryland, Massachusetts, Michigan, Minnesota, Missouri, New York, Ohio, Oregon, Pennsylvania, South Carolina, Tennessee, Texas, Utah, Virginia, Washington, Alberta, British Columbia, Manitoba, Ontario, Quebec, Nova Scotia, Yukon Territory.

Biology.— *Syntomopus americanus* has been reared from a number of stem–mining Diptera, mostly Agromyzidae, but there is one record from a stem–boring cochylid lepidopteran. There is also a possible record from a cynipid gall on white poplar, but I believe that the gall of the poplar–galling agromyzid, *Hexomyza schineri* Giraud, was mistaken for a cynipid gall. The following is a list of host records from specimens examined: United States. CALIFORNIA: Salinas, 20.X.1943, *Agromyza* (=*Melanagromyza*) *virens* Loew (Diptera: Agromyzidae)(USNM). DELAWARE: Newark, 6 & 7.V.1935, ragweed borer material(USNM). MICHIGAN: Gogebic Co., 15.V.1968, in gallery of *Saperda concolor* LeConte (Coleoptera: Cerambycidae)(USNM). NEW YORK: Ithaca, Winter 1925.1926, *Agromyza* (=*Melanagromyza*) *virens* (USNM); 21.II.1939, 6 & 15.III.1939, *Agromyza* (=*Melanagromyza*) *angelicae* Frost (Diptera: Agromyzidae)(USNM). OHIO: Eaton Mountain, 10 & 14.VI.1934, ex *Agromyza* (=*Melanagromyza*) *virens* (USNM). PENNSYLVANIA: 19.XI.1939, ex stems of *Vernonia noveboracensis* (L.) Michaux (USNM). Canada. QUEBEC: St. Romuald, 13.VI.1958, *Agromyza* (=*Hexomyza*) *schineri* on *Populus tremula tremuloides* (Michaux) Loeve & Loeve (CNCI). MANITOBA: Falcon Lake, 8.VII.1965, cynipid[?] gall on white poplar (CNCI); Riding

Mountain National Park, 7.VIII.1966, cynipid[?] gall on white poplar (CNCI). NOVA SCOTIA: Simpson Field Station (Rest. Co.), 5.VIII.1960, *Agromyza* (=*Hexomyza*) *schineri* (CNCI). ONTARIO: Ancaster, various dates in December 1966 and January 1977, *Melanagromyza martini* Spencer (CNCI), 19.XII.1966, *Phytomyza flavicornis* Fallén (Diptera: Agromyzidae) (CNCI); Vinland Station, 23.V.1936, ex *Phalonia voxcana* Kft. (Lepidoptera: Cochylidae) in stems of *Prenanthes alba* L.(CNCI); Windsor, 1948, *Agromyza* sp. in hollyhock [*Melanagromyza hicksi* Steyskal ?] (CNCI). In addition, *Syntomopus americanus* has been collected in association with the following plants: alfalfa at Mesa, Arizona; *Ambrosia* at Sioux City, Iowa and Malden, Massachusetts; ragweed at St. David, Ontario; *Helianthus annuus* L. at Webster, Missouri; *Salix* at Sioux City, Iowa and Logan Canyon, Utah; *Betula* at 58 miles east of Dawson, Yukon; and *Urtica dioica* L. at Ancaster, Ontario.

There are several host records for *Syntomopus americanus* in the literature. This species was reared in the spring from stems of *Ambrosia trifida* L., probably from pupae of *Agromyza* sp. (Webster 1894). *Syntomopus americanus* emerged in January and February along with adults of its host from pupae in stems of hollyhock, *Althaea rosea* (L.)(Malvaceae), in the lab (Hansberry 1940). The host is given as *Agromyza* (=*Melanagromyza*) *angelicae* Frost; however, this agromyzid is a stem borer in *Angelica* spp. (Spencer and Steyskal 1986). The stem-mining agromyzid of hollyhock is *Melanagromyza hicksi* Steyskal and this may be the actual host in the study of Hansberry (1940). Schread et al. (1942) reported *Syntomopus americanus* as a primary parasite of dipterous larvae in stems of the dwarf ragweed, *Ambrosia artemisiaefolia* L. *Syntomopus americanus* was also given as a major parasite of *Agromyza* (=*Melanagromyza*) *virens* puparia in stems of guayule, *Parthenium argentatum* Gray (Asteraceae)(Lange 1944; Cassidy et al. 1950). Parasite records of *Syntomopus americanus* in the studies by Webster, Hansberry, Lange, and Cassidy et al. were verified by me through examination of voucher material in collections.

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